



## 2020 Academic Challenge

### ENGINEERING GRAPHICS TEST – SECTIONAL

#### Engineering Graphics Test Production Team

Ryan Brown, Illinois State University – Author/Team Leader

Ted Branoff, Illinois State University – Reviewer

#### GENERAL DIRECTIONS

Please read the following instructions carefully. This is a timed test; any instructions from the test supervisor should be followed promptly.

The test supervisor will give instructions for filling in any necessary information on the answer sheet. Most Academic Challenge sites will ask you to indicate your answer to each question by marking an oval that corresponds to the correct answer for that question. One oval should be marked to answer each question. Multiple ovals will automatically be graded as an incorrect answer.

Be sure ovals are marked as  , not  ,  ,  , etc.

If you wish to change an answer, erase your first mark completely before marking your new choice.

You are advised to use your time effectively and to work as rapidly as you can without losing accuracy. Do not waste your time on questions that seem too difficult for you. Go on to the other questions, and then come back to the difficult ones later if time remains.

**Time: 40 Minutes**

**Number of Questions: 40**

**DO NOT OPEN TEST BOOKLET UNTIL YOU ARE TOLD TO DO SO!**

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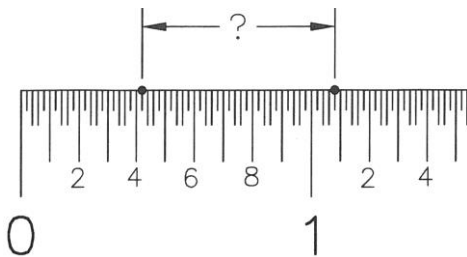


**Academic Challenge**  
**2020 Sectional Engineering Graphics Exam**

1. Although there would be some scrap paper left over, how many engineering system B-size sheets of paper could be obtained from a 24" wide roll of paper that is 8'-0" long?

- A. 5
- B. 8
- C. 10
- D. 11
- E. 13

2. What distance is shown on the illustration below?



- A. 5/8"
- B. .52"
- C. 9/16"
- D. .66"
- E. 11/16"

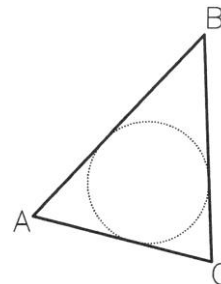
3. Which of the following distances is longest?

- A. 3-3/32"
- B. 3.15"
- C. Circumference of a 1" diameter circle
- D. 8cm
- E. 82mm

4. Given a 4" radius circle, and located 2" over and 2" up from the circle's center point is the center of a 2" radius circle. Which of the following is a **TRUE** statement about these two circles?

- A. the smaller circle is tangent with the larger circle
- B. the smaller circle is totally inside the larger circle
- C. the two circles both fit within a 4" square
- D. the circles are concentric
- E. the smaller circle crosses through the center point of the larger circle

5. Given triangle ABC, identify the **FIRST** step(s) in finding the **incenter** of a circle perfectly inscribed within the triangle. Identify the **TRUE** sentence from the choices below:

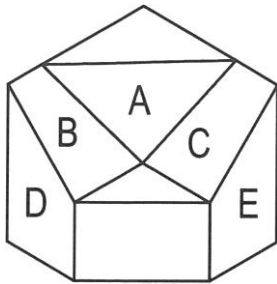


- A. Construct perpendicular bisectors of any two sides
- B. Construct bisectors of any two angles
- C. Construct lines from each vertex perpendicular to the opposite side
- D. Construct semi-circles on each side of the triangle
- E. Construct a line parallel with A-C through the midpoint of A-B, then parallel with B-C through the midpoint of A-C.

6. Given identical front and side views, how many possible TOP views are possible?



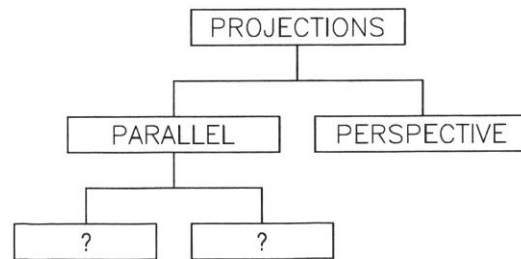
- A. 2  
B. 3  
C. 4  
D. 5  
E. More than 5
7. Surface A is an **oblique** surface, surfaces B and C are **inclined** surfaces, and D and E are **normal** surfaces. Of the six surfaces NOT labeled, how many of them are **normal**?



- A. 2  
B. 3  
C. 4  
D. 5  
E. 6
8. One manufacturing process that integrates well with CAD is CNC. What does the second 'C' stand for?
- A. Control  
B. Computation  
C. Clearance  
D. Computerization  
E. Casting

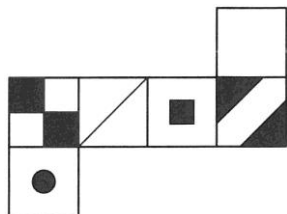
9. In one of the leading CAD programs, the user interface includes ribbon menu tabs that help organize the command icons. One tab entitled \_\_\_\_\_ has the following sub-ribbon panels: *Text, Dimensions, Centerlines, Leaders, & Tables*.

- A. Annotate  
B. Insert  
C. View  
D. Manage  
E. Output
10. With respect to projections, what two scientific terms best fill in the chart below?



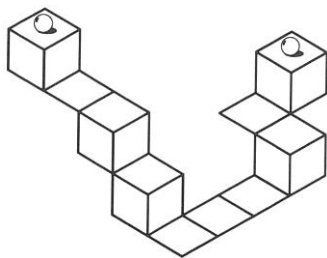
- A. multiview; pictorial  
B. orthographic; oblique  
C. axonometric; trimetric  
D. frontal; profile  
E. first; third
11. The word ACME in a thread note refers to the \_\_\_\_\_ .
- A. class of fit  
B. thread form  
C. manufacturer  
D. supplier  
E. type of pipe

12. In this test of spatial visualization, which of the cubes is a correct match of the flat pattern foldout?



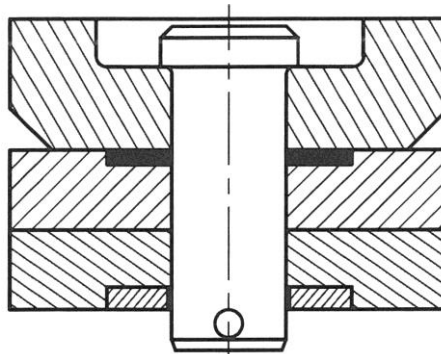
- A.
- B.
- C.
- D.
- E.

13. Given this isometric drawing, and assuming one-inch cubes or square planes in "normal" orientation, approximately how far apart are the two marbles?



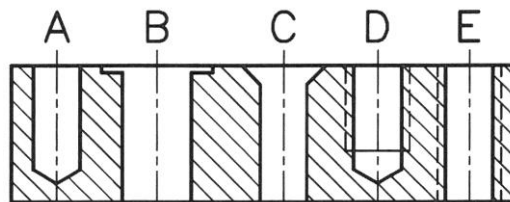
- A. 4.00"
- B. 4.24"
- C. 5.00"
- D. 5.10"
- E. 5.66"

14. In the sectional assembly drawing illustrated below, how many parts are held together by the large pin?



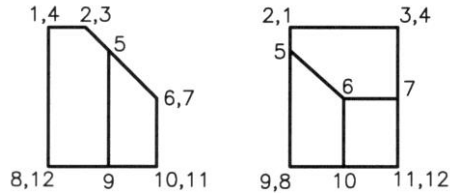
- A. 4
- B. 5
- C. 6
- D. 7
- E. 8

15. The illustration below was created to describe what holes look like in a sectional view. Identify the only one that is shown correctly.



- A. A
- B. B
- C. C
- D. D
- E. E

16. Given a front and side view with corners numbered, identify an inclined surface that would project true size and shape in an auxiliary view projected from a top view.

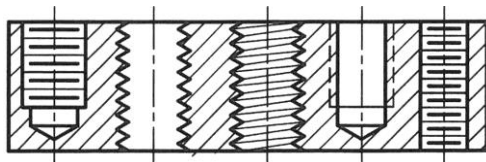


- A. 5-6-10-9
- B. 1-2-5-9-8
- C. 2-3-7-6-5
- D. 6-7-11-10
- E. 1-2-3-4

17. In some 3D CAD programs, the colors red, green, and blue are not optional for one particular aspect, wherein the colors are directly associated with \_\_\_\_\_.

- A. line types
- B. text size
- C. profile constraints
- D. axis directions
- E. dimensioning features

18. In the illustration below, how many of the threaded holes are represented in the schematic method?

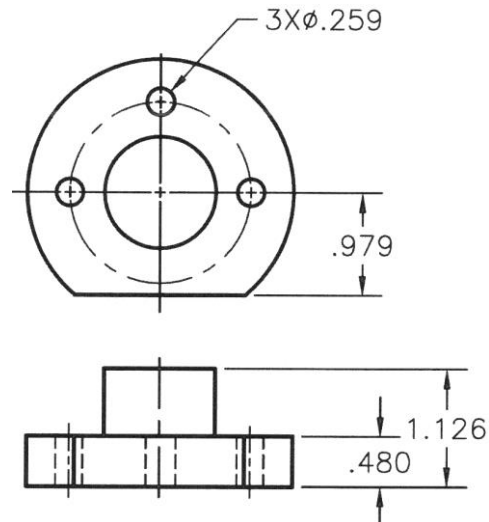


- A. 0
- B. 1
- C. 2
- D. 3
- E. 4

19. For which of the following occasions will the dimension line be in the form of an arc?

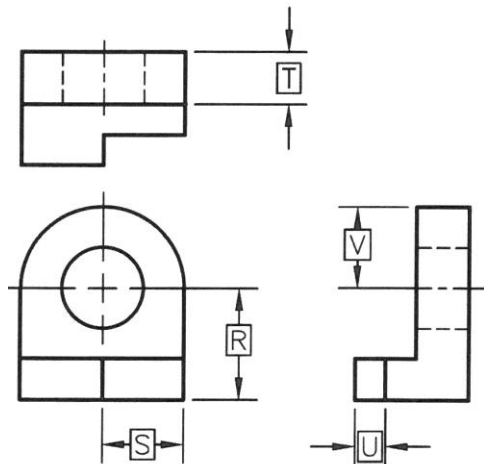
- A. Radius dimension
- B. Angular dimension
- C. Local note
- D. Diameter dimension
- E. Extremely small dimension

20. For the object below, how many additional dimensions will be required to fully dimension the part?



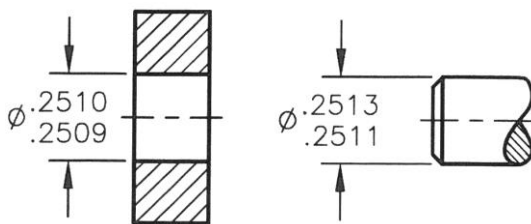
- A. 1
- B. 2
- C. 3
- D. 4
- E. 5

21. In the view below, which of the dimensions does NOT break the rules of "contour dimensioning"?



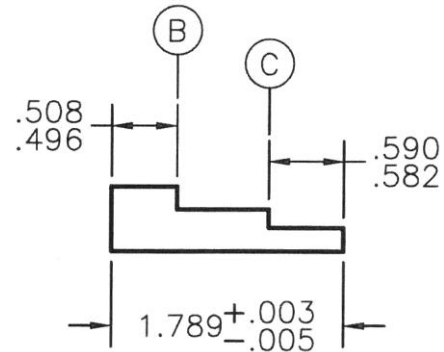
- A. R  
B. S  
C. T  
D. U  
E. V

22. Based on the dimensions given in the illustration below, identify the classification of the "fit".



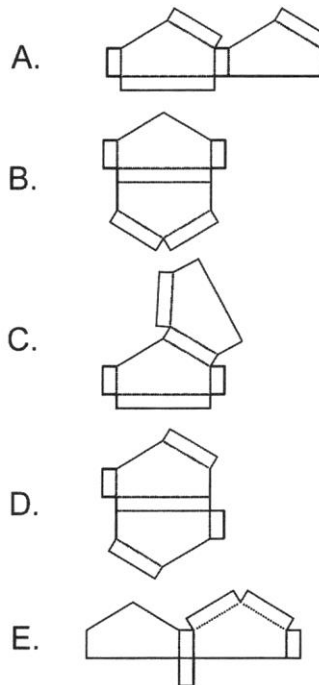
- A. Clearance fit  
B. Interference fit  
C. Running fit  
D. Transition fit  
E. Sliding fit

23. A dimension indicating the distance from B to C would be superfluous. What are the limits of size for the distance from B to C based on the other dimensions?



- A. .694" - .711"  
B. .694" - .705"  
C. .691" - .714"  
D. .686" - .711"  
E. .686" - .714"

24. All of the developments below are for the same object, but one is incorrect. Identify the incorrect development.



PROBLEMS 25 & 26: CREATE ISOMETRIC SKETCHES  
 SELECT AN ANSWER THAT REPRESENTS THE NUMBER OF SEGMENTS REQUIRED

Isometric sketching area with a diamond grid. A small arrow labeled 'A' is at the bottom center.

25. NUMBER OF LINE SEGMENTS:  
 A. 22 B. 23 C. 24 D. 25 E. 26

Isometric sketching area with a diamond grid. A small arrow labeled 'A' is at the bottom center.

26. NUMBER OF LINE SEGMENTS:  
 A. 8 B. 9 C. 10 D. 11 E. 12

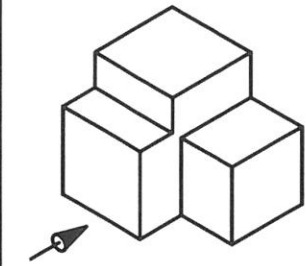
PROBLEMS 27 & 28: MISSING LINE PROBLEMS: SELECT AN ANSWER THAT  
 CORRESPONDS WITH THE LEAST NUMBER OF LINE SEGMENTS (VISIBLE AND/OR  
 HIDDEN) STILL NEEDED TO CREATE A CORRECT AND VALID MULTIVIEW DRAWING

27. MINIMUM NUMBER OF LINES:  
 A. 1 B. 2 C. 3 D. 4 E. 5

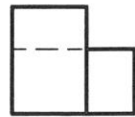
28. MINIMUM NUMBER OF LINES:  
 A. 5 B. 6 C. 7 D. 8 E. 9



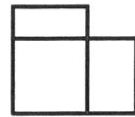
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 NOTE: CENTER LINES OMITTED ON THIS TEST



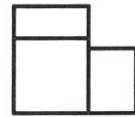
29.



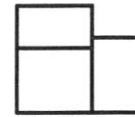
A.



B.



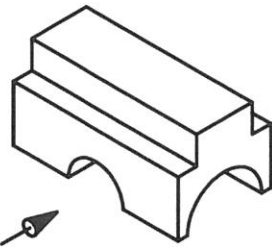
C.



D.

NONE OF THESE

E.



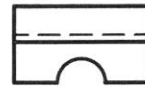
30.



A.



B.



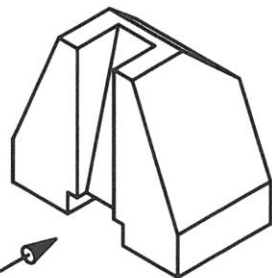
C.



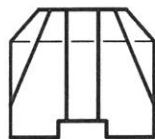
D.

NONE OF THESE

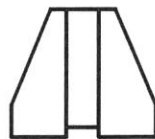
E.



31.



A.



B.



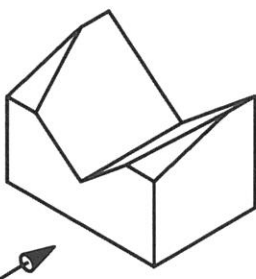
C.



D.

NONE OF THESE

E.



32.



A.



B.



C.

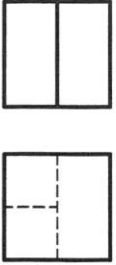
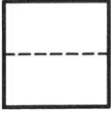
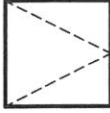


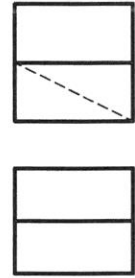
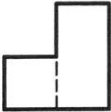
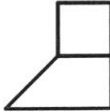



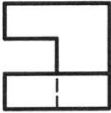

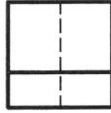
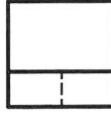
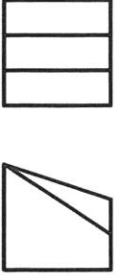
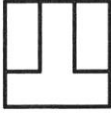
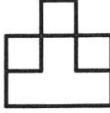
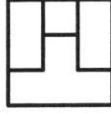
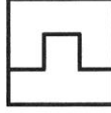


D.

NONE OF THESE

E.

FOR EACH PROBLEM ON THIS PAGE, SELECT A SIDE VIEW  
 NOTE: CENTER LINES OMITTED ON THIS TEST

<p>33.</p>  <p>?</p>	    <p>NONE OF THESE</p> <p>A. B. C. D. E.</p>
<p>34.</p>  <p>?</p>	    <p>NONE OF THESE</p> <p>A. B. C. D. E.</p>
<p>35.</p>  <p>?</p>	    <p>NONE OF THESE</p> <p>A. B. C. D. E.</p>
<p>36.</p>  <p>?</p>	    <p>NONE OF THESE</p> <p>A. B. C. D. E.</p>

FOR EACH PROBLEM ON THIS PAGE, SELECT A FRONT SECTIONAL VIEW  
 NOTE: CENTER LINES OMITTED ON THIS TEST

37.

A. B. C. D. E. NONE OF THESE

38.

A. B. C. D. E. NONE OF THESE

39.

A. B. C. D. E. NONE OF THESE

40.

A. B. C. D. E. NONE OF THESE